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A Remarkable New Dragon-fly from the Eocene (Odonata).

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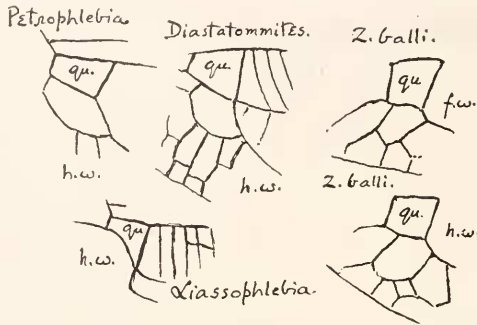
(Plate XIII.)

I am indebted to Professor O. M. Ball, of the Agricultural and Mechanical College of Texas, for the opportunity to describe one of the most magnificent fossil insects which has ever been discovered. It is a large dragon-fly, with the wings outspread as if set by an Entomologist, showing characters which appear to me to place it in a new family of the Anisozoptera. Professor Ball writes: "It came from an assessment hole above the rim rock in Brushy Creek Canyon about twenty-five miles northwest of DeBeque, Colorado, and was collected by a miner who was at that time working for me." The horizon is Green River Eocene. Professor Ball thinks, but is not quite certain, that the actual discoverer of the specimen was Mr. A. P. Hawxhurst, then of Colbren, Colo.

ZACALLITIDAE new family.

Large Anisozoptera, apparently related to the Archithemidae of Handlirsch, and perhaps directly descended from them. In Tillyard's work on the British Liassic Dragon-flies, published by the British Museum in 1925, there is a key to the families, in which the new fossil runs straight to Archithemidae, but differs from *Diastatommites* by a number of important characters, such as the lack of a definite specialized anal vein and anal area, the division of the cells beyond the quadrilateral or discoidal (after the first cell), and the form of the subquadrange. Yet the quadrilateral is strikingly similar, with its upper apical angle acute. From *Scenothemis* our fossil differs in having nearly three times as many cross-veins between nodus and pterostigma, the discoidal not expanding on the apical side, and other features. *Archithemis* has a quite different discoidal, resembling that of *Liassophlebia*. The base of the wing is unknown in *Heterothemis*, *Liadothemis* and *Oryc-*

tothemis, but the parts preserved show no close affinity.* Tillyard questions the reference of those genera in which the discoidal is similar in upper and lower wings to the Anisozygotera, thereby differing from Handlirsch. The genus now



described shows no important difference in the discoidals, but in other respects so closely resembles undoubted Anisozygotera of the Mesozoic, that I do not think it can be excluded from that group. It is however not at all closely allied to the living *Epiophlebia*, though there is more affinity with the Oligocene *Sieblisia* of Bavaria. In *Sieblisia* however the subquadrangle is standardized in the manner of modern forms. The abdomen of *Sieblisia* is proportionately longer than in our insect, but the terminal appendages appear to be about the same. Since Tillyard has described (Trans. Ent. Soc. London, 1928) a typical Zygoteran from the Permian of the Falkland Islands, it is evident that these Anisozygoterous groups had no connection with the Zygotera during the Mesozoic, and must be thought of as a once wide-spread type now almost entirely extinct. The more modern Anisoptera took their place, beginning with the Gomphidae.

ZACALLITES new genus.

Large insects with the aspect of Anisoptera, the wings probably held horizontally in repose, but the discoidal cell is undivided, and supratriangle and subtriangle are not represented. Head small; thorax stout but rather long; abdomen slender, ordinary for Anisoptera, the anal appendages stout and curved.

[**Zacallites* differs, *i. a.*, from the recently described *Karatarvia* (Martynov, Bull. Acad. Sci. Russia, 1925, p. 587, fig. 9), from the Jurassic of Turkestan, in that the latter has the "triangle," or "quadrangle," confluent with the "basal," or "median," cell, as in the case of *Tarsophlebia*.—P. P. CALVERT.]

Nodus before middle of wing; pterostigma well developed, very long. Region beyond the nodus to the apex, and down to the radial forks, essentially as in the Zygopterous *Climacobasis*, though the stigma is considerably longer and the strong sector is conspicuously arched below the stigma. Discoidal cells or quadrilaterals similar in both pairs of wings, the upper apical angle acute, an approach to the Anisopterous type. In the Anisopterous series it approaches nearest to the Gomphidae, and a specially noteworthy feature is the straight (not zigzag) vein dividing the cells after the first beyond the discoidal, that is to say between MA and Cu2 (following Tillyard's revised nomenclature). This feature is observed in the Liassic *Heterophlebia*, except that there it begins four cells away from the discoidal. There is also such a vein in *Liasophlebia*, beginning after three cells from the discoidal. For other details see the description of the species.

The black at the wing-tips recalls species of *Orthemis*, *Thermochoria* and *Eleuthemis*, not otherwise related.

Zacallites balli n. sp.

Head, thorax and abdomen dark, the basal half of abdomen somewhat paler. Head and thorax about 17 mm. long, head 5.7 mm. wide, thorax 8 mm. wide; abdomen 47mm. long, 3 wide in middle, and 4 subapically. Anterior wing 39 mm. long, about 11 wide in middle, nodus 17 mm. from base; pterostigma 5.3 mm. long. Posterior wing 36 mm. long, 9.7 wide in middle, nodus 14.5 mm. from base, pterostigma 5 mm. long. Wings clear, with the apical margin black or dark brown, the dark color sharply defined, beginning on costa about 12 mm. from apex, and ending in a sharp point about 10 mm. from apex on lower margin; the width of the black in apical region about 3 mm. on anterior wings and nearly 4 on hind. The stigma is enclosed in this dark area, which also includes 7 or 8 costal cells before stigma. The detailed description of the venation is from the anterior wing.

Fourteen or fifteen cross-veins before nodus, and thirty between nodus and stigma, the more apical cells very small. Before the nodus, the cross-veins are not continuous with the next series below, but after the nodus they frequently, though by no means always, are. There are seventeen cells below the stigma, these being very small, and higher than broad. Beyond the stigma the cells are numerous, in two rows. Subnodus very oblique, with R3 separating just below its end, but with a short basal bend, which prevents it from being in a line with the subnodus. In the fork of R2-R3 are four cells before the doubling begins, but on one side the second cross-vein is di-

vided above, making a Y. In the upper division, between R2 and R3, above the strong sector, the cells are very irregular, with three rows below the stigma, the upper two invaded by the black, while on the margin are six rows of very small cells, greatly crowded. In the lower division, below the sector, are twelve cells from the doubling to the further subdivisions, and then about four until there are three rows of cells, and at the widest part (2 mm. wide or high), below the middle of the stigma, are five rows of cells, while on the apical margin are six rows of small cells.

In the apical area there are three rows of cells between R1 and R2. Vein 1R3 arises in the usual manner 12 cells basad of end of subnodus, the last three cells above 1R3 much higher than broad. Beyond the level of the subnodus it runs close to R3, but apically rapidly diverges from it, curving downward, so that the interval forms a broad fan, with five rows of cells in subapical region. The fan is much broader than in *Climacobasis*. R4+5 is a very weak vein, arising at a sharp angle, and bounded below by three and a half square cells before level of origin of 1R3. In its course before the level of the nodus it has one row of square cells above and one below, about 16 below from its origin to level of nodus. In the apical field there is a broad fan above, as in the interval above 1R3. Vein MA is very strong, originating in the usual manner at the arculus, and having a straight course as far as level of nodus, with 19 or 20 cells below it between discoidal cell and level of nodus. Discoidal cell (quadrilateral) diamond shaped, with the upper apical and lower basal corners acute angles, the others obtuse angles; a strong straight vein, beginning in the second cell beyond discoidal cell, running close below MA, with one row of cells between, until the subapical spreading. Basal space not crossed. Subquadrangle not differentiated, merely an elongate (high) oblique cell below discoidal. No supratriangle (such as occurs in the Anisoptera). Vein Cu2 leaves the lower corner of the discoidal cell, at first downward, but rapidly curving and arching upward before the level of the nodus, and reaching the margin 21 mm. from the base of the wing. In the region below the arculus it is separated from the margin by two rows of cells, but at the widest part are about seven cells between it and the margin, and below it are two quite distinct curved sectors. Anal zigzag. The cubitoanal area in front wing is 4 mm. across at widest, in hind wing 5 mm.; a character of Anisozygoptera.

According to present estimates of geological time, the interval between the Lias and Upper Eocene must be over fifty

million years. It is evident that in the evolution of insects new types have arisen without necessarily displacing the old, and this has happened more easily because the great multitude of situations occupied by insects affords opportunities for success to innumerable diverse species. Among the discoveries possible to entomologists, few are more interesting than surviving relics of nearly extinct groups, and these may be found either as fossils or in the living fauna.

The figures of the discoidals and adjacent cells of Liassic genera are copied from Tillyard. The beautiful photograph (Plate XIII), enlarged rather more than one half, is the work of my colleague, Mr. Paul F. Shope.

The specimen will be placed in the collection of the A. & M. College of Texas, College Station, Texas.

A New Species of Oedematocera with Notes on Schistocercophaga Townsend (Dipt.: Tachinidae).

By J. M. ALDRICH, National Museum, Washington, D. C.

Besides *Hypostena flavcola* Coquillett, the type species, this genus contains *Hypostena gilvipes* Coquillett and the recently described *Oedematocera dampfi* Aldrich (Proc. Ent. Soc. Wash., vol. 29, 1927, p. 17). The last is a widespread and common parasite of the tropical Migratory Locust, *Schistocerca paranensis* Burmeister. *Gilvipes* has been reared from a cricket in Kansas (sent for identification by Professor S. J. Hunter). The host relations of *flavcola* are unknown, as are those of the new species here described.

Oedematocera striata new species.

Female.—Front at vertex .30 of head width, the eyes diverging very gradually and uniformly, so that just above the vibrissae they are separated by .48 of the head width. Pollen of head distinctly yellow on parafrontals and posterior orbits, silvery on parafacials; cheek about one-eighth of eye height, reddish; palpi and proboscis yellow; parafacials narrow, on lowest part only one-third as wide as third antennal joint. Antennae red at base, gradually infuscated on third joint, which is of ordinary width and four times the third; arista bare, reddish at base, thickened on about the basal fourth, basal joints short; facial ridges sharp, with some small hairs below. Ocellars proclinate, divergent; the usual two pairs of orbitals.

Thorax black in ground color, heavily overlaid with yellowish